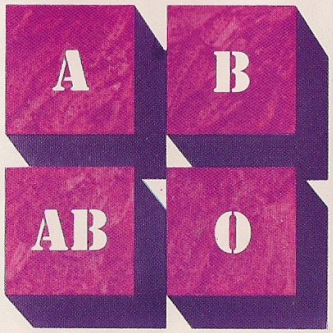
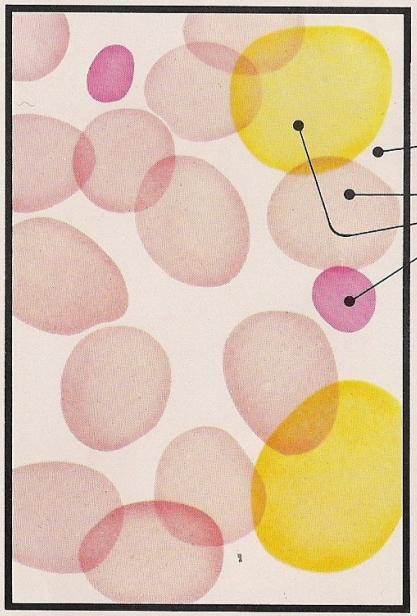
RARE BLOOD GROUPS

In the early part of the 20th century Karl Landsteiner, a Viennese physician, discovered that human blood belongs to one of four main groups; the present ABO system of blood grouping defines these as A, B, AB and O.





The ABO Blood Groups

Blood consists of a colourless fluid called plasma in which are suspended various microscopic solid bodies:
red cells,
white cells and
platelets.

The red cells and plasma are used in identifying blood groups. A donor belonging to group A has on his red cells a substance called the A antigen; a group B donor has the B substance or antigen; group AB has both A and B antigens while group O has neither.

Red cells with these antigens (A and B) can be identified by their reactions with the two antibodies Anti-A and Anti-B, which normally occur in the plasma of persons whose red cells lack the corresponding A or B antigens (see table below) and are produced by the body's defence mechanism, developing shortly after birth. Plasma would not normally contain antibody which reacts with the individual's own red cells.

The antibodies cause the agglutination or clumping of the red cells in blood which is incompatible, for example if group A blood is given to a patient whose blood is group B, the Anti-A antibodies in the patient's blood would react with the A antigen in the donor's blood and would result in a transfusion reaction.

Your Blood Group	Antibodies in Your Plasma
A	Anti-B
B	Anti-A
AB	Neither
O	Anti-A and Anti-B

National Panel of Rare Blood Donors

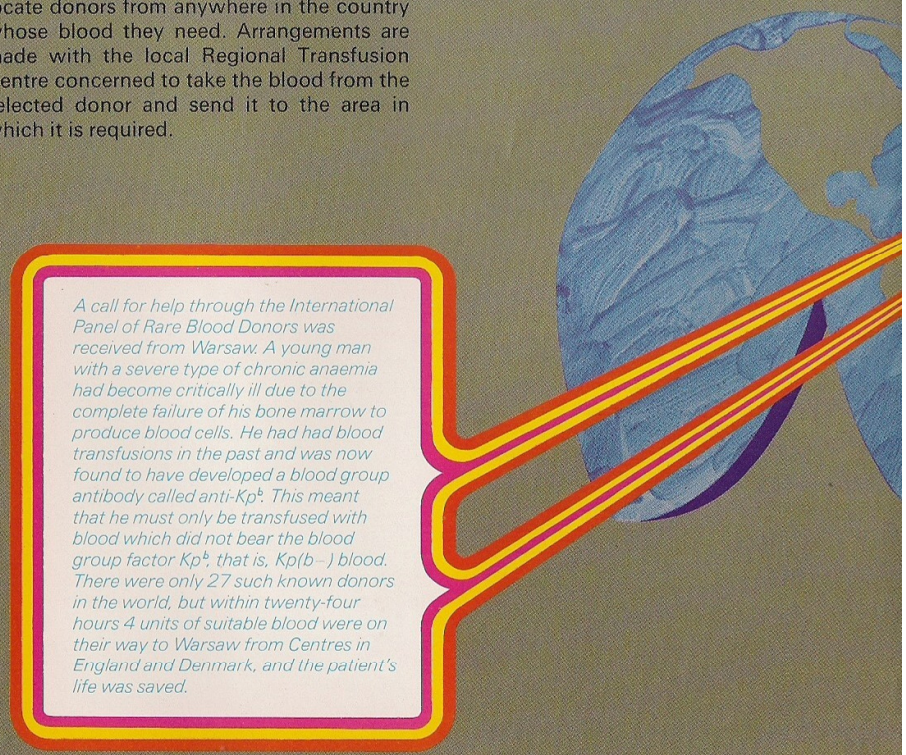
The selection of blood for patients whose plasma contains some of these antibodies could take a long time, were it not for the fact that the identification of rare blood types in donors is already a routine matter at Regional Transfusion Centres. The blood of many thousands of donors is examined yearly and where rare types are identified full details are supplied to the Blood Group Reference Laboratory in London. A list of names of such donors exists and is known as the National Panel of Donors of Rare Blood Types. This list gives the areas in which they live and full details of the blood type. All centres regularly receive up-to-date copies of this list and each can quickly locate donors from anywhere in the country whose blood they need. Arrangements are made with the local Regional Transfusion Centre concerned to take the blood from the selected donor and send it to the area in which it is required.

International Panel of Rare Blood Donors

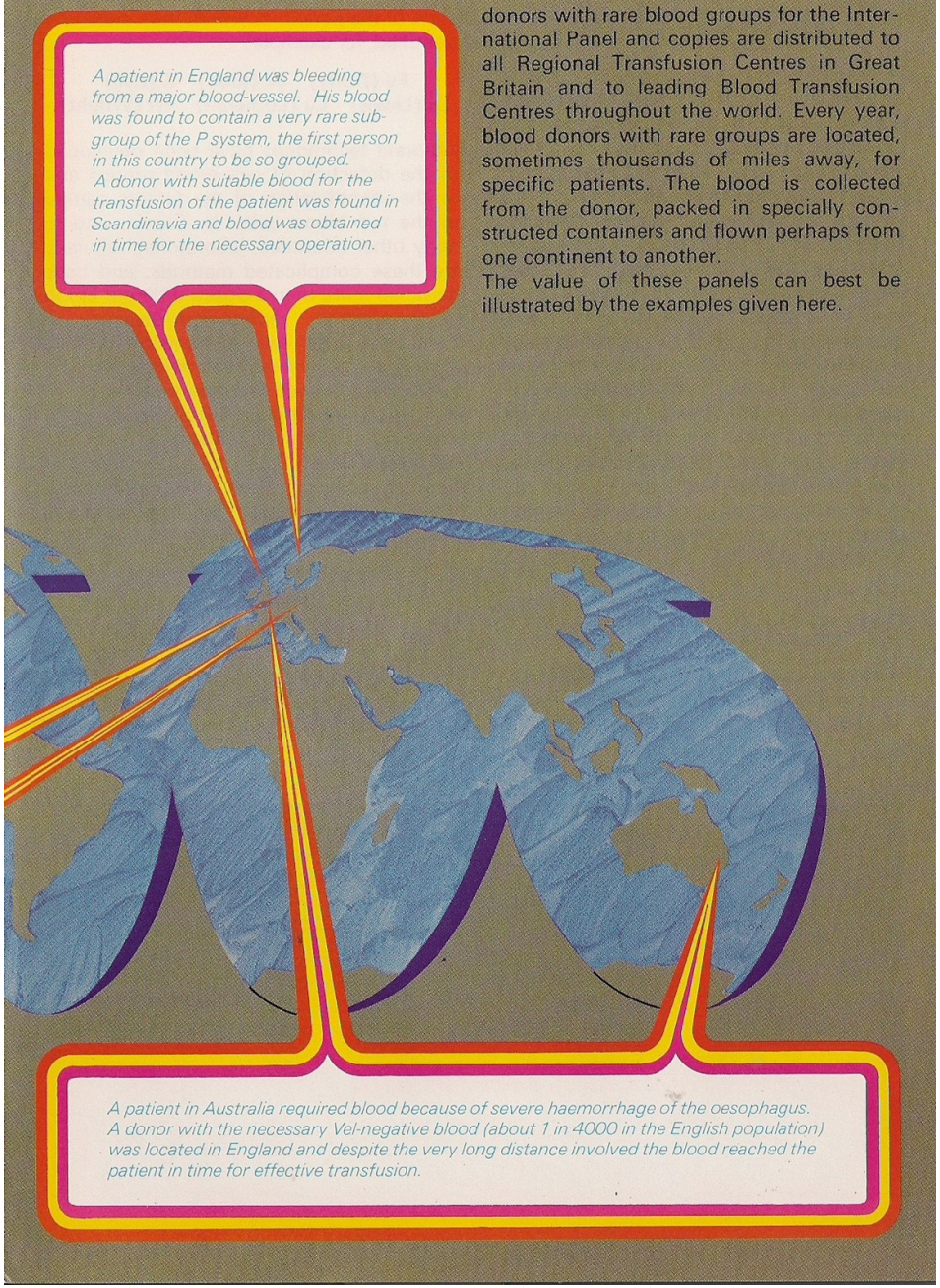
There are a few patients whose blood groups are so rare that sufficient donors may not be found in their own country. For these very exceptional patients blood can be located by means of an International Panel of Donors of Rare Blood Types which is, in effect, an extension of the National Panel.

Twenty-eight nations provide details of donors with rare blood groups for the International Panel and copies are distributed to all Regional Transfusion Centres in Great Britain and to leading Blood Transfusion Centres throughout the world. Every year, blood donors with rare groups are located, sometimes thousands of miles away, for specific patients. The blood is collected from the donor, packed in specially constructed containers and flown perhaps from one continent to another.

The value of these panels can best be illustrated by the examples given here.



A call for help through the International Panel of Rare Blood Donors was received from Warsaw. A young man with a severe type of chronic anaemia had become critically ill due to the complete failure of his bone marrow to produce blood cells. He had had blood transfusions in the past and was now found to have developed a blood group antibody called anti-Kp^b. This meant that he must only be transfused with blood which did not bear the blood group factor Kp^b, that is, Kp(b−) blood. There were only 27 such known donors in the world, but within twenty-four hours 4 units of suitable blood were on their way to Warsaw from Centres in England and Denmark, and the patient's life was saved.



A patient in England was bleeding from a major blood-vessel. His blood was found to contain a very rare sub-group of the P system, the first person in this country to be so grouped. A donor with suitable blood for the transfusion of the patient was found in Scandinavia and blood was obtained in time for the necessary operation.

A patient in Australia required blood because of severe haemorrhage of the oesophagus. A donor with the necessary Vel-negative blood (about 1 in 4000 in the English population) was located in England and despite the very long distance involved the blood reached the patient in time for effective transfusion.

The Rhesus Factor

In addition to the ABO groups, there is another system of red cell classification used as a matter of routine. About six out of seven people in Great Britain have in their blood a substance called the Rhesus or Rh factor – they are called Rh Positive. Those without the factor are called Rh Negative. Naturally occurring Rh antibodies are almost unknown, but if an Rh Negative patient were transfused with Rh Positive blood, then an antibody to the Rh factor would probably be formed. If an anti-Rh antibody is formed, it will stay in the bloodstream and may cause trouble if Rh Positive blood is transfused; in the case of an Rh Negative mother sensitised by the Rh factor any further pregnancies of Rh Positive children could be affected. For these reasons, it is most important to give only Rh Negative blood to persons whose red cells lack the Rh factor.

Other Blood Groups

There are many other classifications, some indicated by letters of the alphabet, such as M, N, S, P and others by contractions of the name of the person in whom they were first identified, for example:

Fy (Duffy) Jk (Kidd) K (Kell)
Le (Lewis) Lu (Lutheran) Wr (Wright)

Elaborate techniques have been developed for the detection of rare blood groups and for the identification of the factors carried on the red blood cells. In Britain, and in many other countries, laboratories regularly use these complicated methods, and have identified more than a dozen different blood group systems; various sub-divisions of these have also been demonstrated. It is possible to define nearly two million different combinations based on these systems.

With so many different blood group combinations it is highly unlikely to find two individuals with blood group combinations identical in every respect. The commonest of these combinations in the United Kingdom is about 1 in 270, and is:

O, MsNs, P_1, CDe/cde, Lu(a–), K–,
Le(a–b+), Fy(a+b+), Jk(a+b+)

Luckily, naturally occurring antibodies to most of the other blood groups just referred to are found only rarely, and, unlike the Rh groups, transfusion of blood carrying one or more of these factors does not readily cause a patient to form an antibody. A patient can normally be transfused with blood of the same ABO and Rhesus groups but on occasion it is necessary to select donors whose red cells are matched for some of the other groups as well. This is most likely to occur when the patient has received many previous transfusions of blood and has, as a result, developed a complicated mixture of red cell antibodies. The provision of properly matched donor blood for such people can sometimes present difficulties.

As already mentioned, people do not normally form antibodies against their own cells: as with the ABO and Rh groups, antibodies exist or are formed against 'foreign' blood groups, that is, against blood group factors the individuals themselves do not possess. To provide blood which also lacks these factors and will not be affected by the antibody or antibodies can occasionally pose considerable problems. There may be difficulty in finding donors who lack certain combinations of factors. For example, group O Rh Negative patients who have Rh, Fy and Jk antibodies would need O, Rh Negative, Fy Negative and Jk Negative blood which occurs in 0·7 per cent of the population. The difficulty in other cases may be that the antibody is to a very common single factor and that donors, like the patient, who lack this are few and far between. A patient with one of the Lutheran group antibodies, Anti-Lu^b, would lack the factor Lu^b and require donors also lacking Lu^b, of which there is only about 1 in any 1,000 population.

Recent Developments

Normal storage does not keep whole blood in a usable condition longer than three weeks but a technique has been developed which enables blood to be kept for several years. The blood is stored in liquid nitrogen at low temperature, that is, at 196 degrees centigrade below freezing point (the usual temperature for blood storage is 4 degrees centigrade above freezing point).

A donor with a rare blood group can give blood at intervals of six months, and this can be stored so that several donations can be readily available when required for a patient or even for the donor himself, should he require a transfusion at any time. There are several blood banks in Britain and a number overseas where blood can be frozen in this way and so kept for patients anywhere in the world.

It is important to remember that blood of a rare type will not often be required – for instance, of 750,000 donations transfused over a 12-month period, only nine were for patients of rare groups. Nevertheless, without the help of National and International Panels of Donors of Rare Blood Types and without the development of banks of frozen blood, the lives of some of these patients could not have been saved. Today, the treatment of patients who have rare blood types creates little more of a problem than that of the many thousands of others transfused each year whose plasma contains no complicated blood group antibodies.

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